

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

EME1016 – APPLIED STATICS

(ME)

17 OCTOBER 2019

9:00 a.m – 11:00 a.m

(2 Hours)

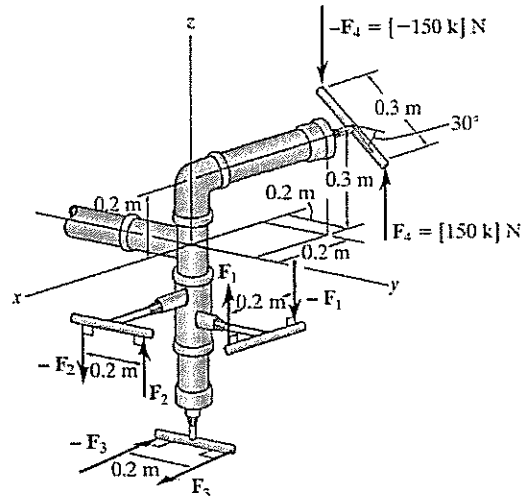
INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 6 pages with 4 Questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1:

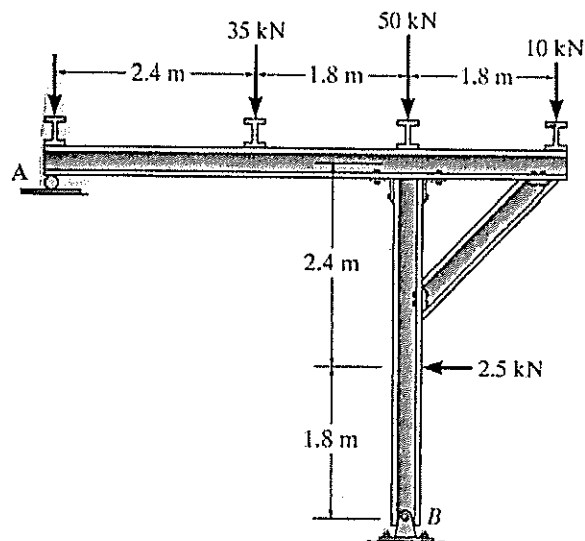
- (a) Four couples are acting on the pipe column. Given $F_1 = 150 \text{ N}$, $F_2 = 170 \text{ N}$ and $F_3 = 90 \text{ N}$.

- Find the Cartesian vector form for each of the couple moment. [10 marks]
- Determine the magnitude of the resultant couple moment. [2 marks]
- Determine the coordinate direction angles of the resultant couple moment. [3 marks]

**Figure 1**

- (b) **Figure 2** shows a frame that being supported by 2 supports at Point A and Point B.

- Draw the FBD of the frame. [4 marks]
- Determine the force acting at support A and B. [6 marks]

**Figure 2**

Continued.....

Question 2:

Figure 3 shows a truss which is supported by four external loads. The truss is supported by a hinge at A and roller at E. Given $P_1 = 20 \text{ kN}$ and $P_2 = 16 \text{ kN}$.

- (a) Draw the FBD of the truss. [4 marks]
- (b) Determine if zero force member exists in the truss. Specify? [2 marks]
- (c) Find the reaction of the support at A and G. [10 marks]
- (d) Find the internal force within the members EB, CD and CB. State whether it is compressive or tensile. [9 marks]

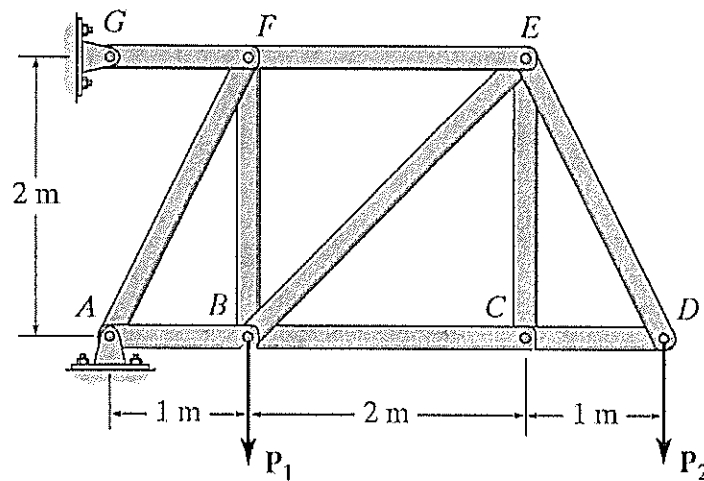
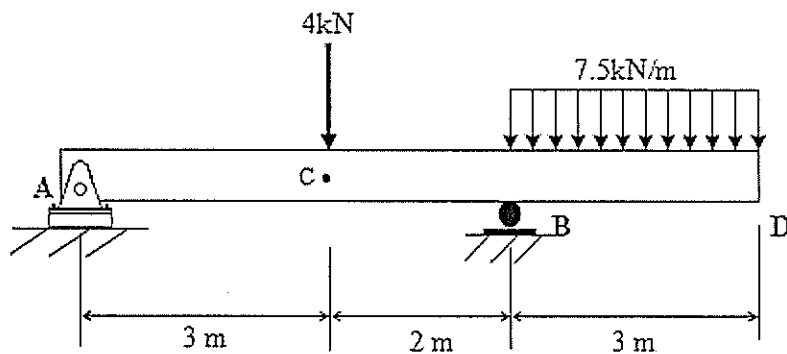


Figure 3

Continued.....

Question 3:

- (a) Draw the free body diagram and determine the reactions at pin A and roller B on the beam as shown in **Figure 4**. [8 marks]
- (b) Draw the shear force and bending moment diagrams for the supported beam as shown in **Figure 4**. [17 marks]

**Figure 4**

Continued.....

Question 4:

(a) For the beam's cross sectional areas as shown in **Figure 5**.

- (i) Determine the location \bar{x} of the centroid, C of the beam's cross-sectional areas. [5 marks]
- (ii) Determine the moment of inertia for the beam's cross-sectional area about the y' axis. [5 marks]

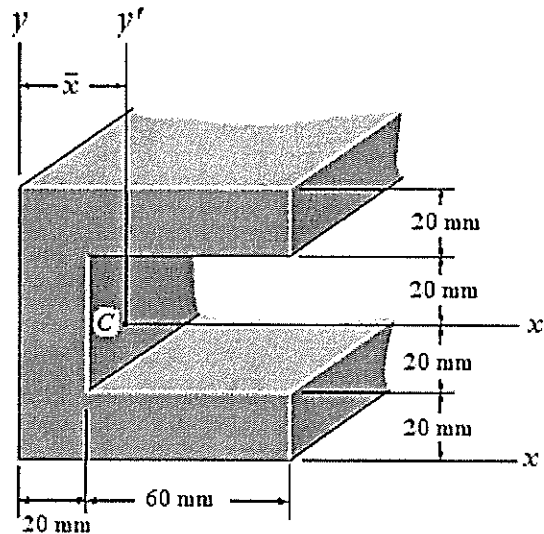


Figure 5

(b) The weight of 16 N block A is attached to link AC and rests on the weight of 24 N block B as shown in **Figure 6**. Knowing that the coefficient of static friction (μ_s) is 0.20 between all surfaces of contact and neglecting the mass of the link AC .

- (i) Draw the free body diagram (FBD) of the block A and block B . [5 marks]
- (ii) Determine the value of θ in degree for which motion of block B is impending. [10 marks]

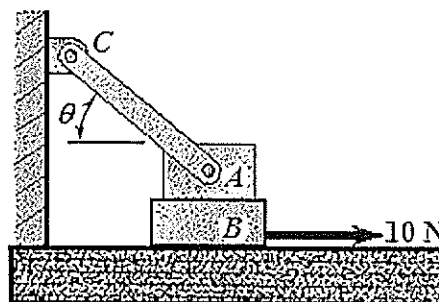
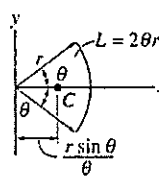
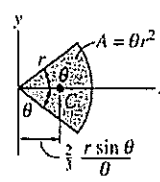
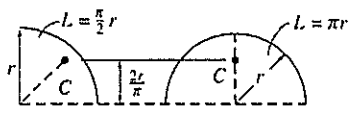
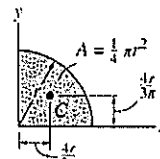
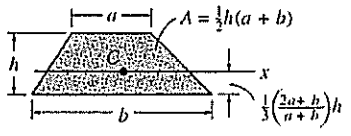
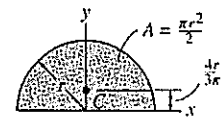
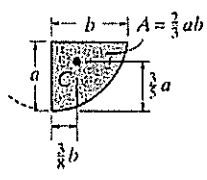
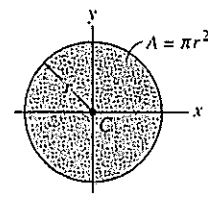
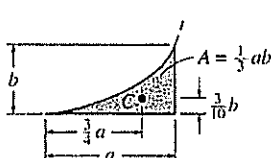
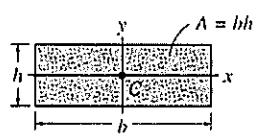
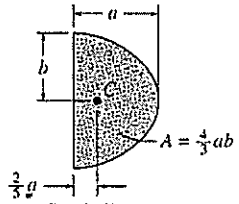
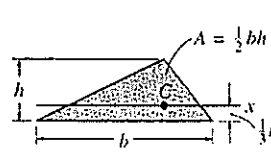


Figure 6

Continued.....

Appendix: Geometric properties of line and area elements

Centroid Location	Centroid Location	Area Moment of Inertia
 <p>Circular arc segment</p>	 <p>Circular sector area</p>	$I_x = \frac{1}{4} r^4 (\theta - \frac{1}{2} \sin 2\theta)$ $I_y = \frac{1}{4} r^4 (\theta + \frac{1}{2} \sin 2\theta)$
 <p>Quarter and semicircle arcs</p>	 <p>Quarter circle area</p>	$I_x = \frac{1}{16} \pi r^4$ $I_y = \frac{1}{16} \pi r^4$
 <p>Trapezoidal area</p>	 <p>Semicircular area</p>	$I_x = \frac{1}{8} \pi r^4$ $I_y = \frac{1}{8} \pi r^4$
 <p>Semiparabolic area</p>	 <p>Circular area</p>	$I_x = \frac{1}{4} \pi r^4$ $I_y = \frac{1}{4} \pi r^4$
 <p>Exparabolic area</p>	 <p>Rectangular area</p>	$I_x = \frac{1}{12} b h^3$ $I_y = \frac{1}{12} h b^3$
 <p>Parabolic area</p>	 <p>Triangular area</p>	$I_x = \frac{1}{36} b h^3$

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